

**Instructions:** Please complete this Project Concept Template no later than 4 weeks before the Executive Committee Meeting at which the proposal will be presented (June or November each year) and forward to the Executive Committee Support Services Unit, ESSU - malcolm.orme@aecom.com

*Important note: Once completed, this Project Concept Proposal will be used by the EBC Executive Committee to help to decide whether to develop a full Project ("Annex") Proposal. Only with the agreement of the EBC Executive Committee should the full Annex Proposal then be developed at an international workshop to which all EBC member countries have been invited.*

**EBC Strategic Planning  
- EBC Project Concept**

<b>Proposed Project Title</b>	Demand Response of Buildings in District Heating and Cooling Networks
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**Date**

*Provide a brief description of the proposed project and the objectives.*

The point of departure for this project lies in the vision that application of the energy flexibility and demand response of buildings in thermal grids can facilitate the conversion to 4th generation District Heating Networks (DHN) and thus speed up the evolution towards decarbonisation. It has been proven that buildings are capable of offering flexibility to the power grid by smart control of heat pumps, EVs or white goods. However, in a significant share of European households heat demand is satisfied by district heating, and if present, the thermal infrastructure is considered as the strategic component of roadmap towards low-carbon future and gas-free neighborhoods. Limited attention has been given to how the modulation of heat demand in buildings can enhance operation of thermal grids and thus mitigate the mismatch between local thermal and electricity grid and in the long run contribute in the transition to fossil fuel free energy system.

The thermal grids are now in transition from a publicly-owned district heating and cooling (DHC) sector, to new Private-Public Partnerships that rather deliver comfort to their customers than selling hot water. It is expected that in the future DHC network operators will also be more confronted with the separation of heat production and distribution net management and the involvement of prosumers. Secondly, smart heat meters and smart control are increasingly introduced in building heating systems in the district heating sector providing new opportunities for the optimization of operation and control. Therefore, it is a perfect time to detect transition barriers for policy and business development, to look for new opportunities of greater end-users engagement in operation and control of thermal grids and to investigate the need for introduction of new technology to make benefit of the new opportunities. Buildings/customers should not be considered anymore just as a simple demand-side variable but also as a community capable of delivering solutions and/or creating sustainable business cases for district heating development. Up to now there is no clear overview of policy instruments, stakeholder collaboration and emerging business models that can support this transition or on technology and data analysis to deliver new operational strategies.

No previous or ongoing IEA EBC or IEA DHC annexes have dealt directly with the above issues. However, several IEA annexes have carried out investigations and have obtained results that are valuable for the here proposed annex. These are e.g.: “Annex 51 “Energy Efficient Communities”, Annex 67 “Energy Flexible Buildings”, DHC Annex TS3 “Hybrid Energy Networks”. Furthermore relations can be established with on-going IEA annexes such as Annex 75 “Cost-effective Building Renovation at District Level Combining Energy Efficiency & Renewables”, as well as ongoing annexes in DHC, DSM and ECES programmes.

Objectives of the proposed new Annex:

- Define the main challenges of the 4th generation District Heating and cooling Networks with distinction between new or existing districts and the integration of ‘community’ utilities (Subtask A)
- Map cooperation models and define the social, economic and comfort boundaries of the stakeholders associated with introduction of new cooperation models (Subtask A)
- Map the stakeholders and their concerns to meet the challenges of the end users and identify stakeholder collaboration opportunities and barriers for business model development (Subtask A)
- Map existing technologies and evaluate their ability to deliver and control heat/cooling demand response to district heating and cooling networks (Subtask B)
- Provide recommendations and new design guidelines for heating/cooling substation and building heating systems capable of delivering high demand response as well as customer comfort (Subtask B)
- Develop new district heating substation and building heating/cooling systems capable of meeting the demands of DHC networks and households (Subtask B)
- Optimize operation of heating system in buildings under the condition that they are over-dimensioned (Subtask B)
- Develop methodologies for analyzing big data delivered by smart DHC meters and BMS for building and DHC network control and optimization (Subtask C)
- Investigate on a Virtual Building and Heat Platform technically and economically feasible local (buildings) and community-scale (power-to-heat systems) heating and cooling response measures and strategies on the district heating network (Subtask C)
- Demonstrate and investigate building heating/cooling energy flexibility measures and strategies through experimental studies in existing DHC networks (Subtask D)

To address these objectives we propose an annex with the following main subtasks:

- Subtask A: Barriers and opportunities for district heat flexible buildings
- Subtask B: Development of technical solutions and control systems for improved heat demand response in buildings
- Subtask C: Development of strategies for building heat demand response in district heating networks (including development of methods and tools)
- Subtask D: Experimental case studies of building heat demand response in existing DHC networks

***Who would be the intended target audience (receptor) for each specific project outcome?***

The outcome of the annex could be:

- Overview of the challenges, potential and benefits of using building heat and cooling demand response in DHC networks
- New strategies and solutions (business models, stakeholder collaboration, activity planning, control strategies, technologies) that can be applied in buildings and communities connected to a DHC network
- Documentation of performance and experiences from documented case studies (virtual and real)

The target audience will be the construction industry (building designers and urban planners, manufacturers of HVAC systems and cogeneration, building and community storage systems), utility companies and DSOs (especially district heating and cooling networks), designers/engineers of energy system, market planners and business developers, social practice researchers and community activators, national governmental and international (e.g. EU) policy makers, local authorities and renewable energy communities.

The scope of the project is very broad and tackles many issues, therefore, a possible collaboration with projects in District Heat and Cooling (DHC) and Energy Conservation through Energy Storage (ECES) programs is planned.

**Briefly, how does the proposed project relate to the current EBC Strategic Plan and, if any, upon which previous EBC project(s) would it build? ([www.iea-ebc.org/strategy](http://www.iea-ebc.org/strategy))**

- Explain how would it target 'step change' or 'disruptive' rather than 'incremental' impacts?

The proposed research project is clearly in line with the global mission of IEA EBC: “to develop and facilitate the integration of technologies and processes for energy efficiency and conservation into healthy, low emission, and sustainable buildings and communities, through innovation and research” as well as to the strategic plan 2014 - 2019.

This project supports the strategic goal of “Community scale methods” with the R&D items:

- Methods and tools to evaluate and find ways to utilize low temperature heat sources and renewable energy sources and to improve information dissemination to benefit municipalities
- Business models for the introduction of energy system solutions with high performance and economic efficiency
- Dynamic system modelling of technological and economic interactions, including different forms of energy grids, local sources and buildings, as so called “prosumers” – producers and consumers at the same time – as well as storage (drivers, requirements, targets, scenarios, validation with case studies)

The here proposed project deals with all the above three mentioned R&D items.

**State any expertise or skills the project will require that you have not already been able to source.**

It is anticipated that all required expertise can be provided by the Annex participants. Collaboration is foreseen with experts in projects in DHC and ECES.

**What is your initial estimate for how long the project will take to complete:**

- For the preparation phase (typically 1 year)? 1 year
- For the working phase? (typically 2 to 3 years)? 3 years
- For the reporting phase (typically 1 year)? 1 year

**Has a relevant 'Technology Readiness Assessment' already been carried out in any of the interested countries? No**

(With the agreement of the EBC Executive Committee, a preliminary 'Technology Readiness Preliminary Assessment' should be carried out as part of the international workshop to develop the full Annex proposal. Separate guidance for this will be provided.)

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<b>Telephone</b>	+45 51427098
<b>Will you be able to:</b>  - Lead development of the proposal? - If approved by the Executive Committee, act as the project manager (“Operating Agent”)?	Yes  Yes (Depending on future funding)
<b>Name of your national EBC Executive Committee member</b>	Per Heiselberg
<b>Not including EBC participating organisations, state which other organisations with whom you propose to collaborate on this project</b>	<a href="http://www.iea-ebc.org/contacts">www.iea-ebc.org/contacts</a>
<b><i>For national Executive Committee member use</i></b>	<i>Do you approve this proposal for submission to the ExCo? (Yes)</i> <i>Are the objectives clearly stated? (Yes)</i> <i>Do the objectives align with the EBC Strategic Plan? (Yes)</i> <i>Is the scope clearly stated? (Yes)</i>

## Summary of Annex Development and Quality Assurance Process

Step	By When	By Whom
<b>1. Complete this EBC Project Concept Template</b>	<b>4 weeks before the EBC Executive Committee Meeting at which the project concept will be presented (held in June or November each year)</b>	<b>You and your national EBC Executive Committee Member</b>
<i>For your reference, the later steps (2) to (9) are explained below</i>		
2. Decide whether to develop EBC Project Concept into a full Annex proposal	EBC Executive Committee Meeting	EBC Executive Committee
3. Convene an international workshop to which all EBC member countries have been invited, including a 'Technology Readiness Preliminary Assessment'. Agree timing for review of the draft Annex Text with your national ExCo member and the Annex Adviser	7 weeks before the next EBC Executive Committee Meeting	You
4. Develop a full EBC Annex proposal in the form of a draft Annex Text (see EBC Operating Agent Guidelines for more information)	5 weeks before the next EBC Executive Committee Meeting	You and the workshop participants
5. Review draft Annex Text	4 weeks before the next EBC Executive Committee Meeting	Your national ExCo Member and the Annex Adviser
6. Update draft Annex Text based on national ExCo member and Annex Adviser feedback and send to ESSU	3 weeks before the next EBC Executive Committee Meeting	You
7. Circulate draft Annex Text to the EBC Executive Committee	No later than 2 weeks before the next EBC Executive Committee Meeting (hard deadline)	ESSU
8. Discuss draft Annex Text in EBC member countries and decide on national participation	Next EBC Executive Committee Meeting	EBC Executive Committee
9. Decide whether to approve new EBC Annex based on draft Annex Text and proceed to Preparation Phase	Next EBC Executive Committee Meeting	EBC Executive Committee